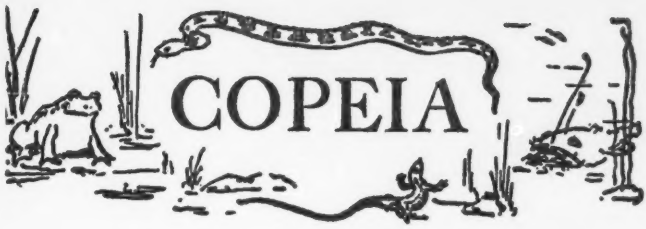

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NEED FOR RACIAL STUDY OF FISHES

As the supply of a given species of fish begins to decrease, the natural tendency on the part of the commercial fishermen is to increase the intensity of fishing effort by adding more units of gear, or using improved gear, etc. Modern fisheries science aims to regulate the intensity of fishing effort to prevent an undue strain being placed on the fishery. This practice involves the setting up of measure of intensity so that we may determine when to call a halt to further operations in any season. In establishing such measures of intensity, one desirable method involves dividing the area with which a given fishery prosecutes, into zones. The more closely these zones conform to natural boundaries the more satisfactory they will be.

Fishery investigations in this country and abroad have disclosed the existence of what for want of a better term we may designate as races. These races are more or less localized, at least during the spawning season, and in many cases may be readily distinguished by structural characters. Often these differences are recognized by the fishermen long before they are detected or defined by the scientist. These races are more or less isolated, and granted sufficient isolation over a long enough period of time, the divergence may continue to a point warranting their being given specific rank.

The existence of racial differences have been clearly shown in the salmon, halibut, herring, pilchard, mullet, mackerel and the coregonine fishes of the Great Lakes. Undoubtedly further investigations will disclose the existence of racial differences in many other species if not in all. The nature and extent of the differences varies greatly.

Dr. W. H. Rich has called to my attention a striking case among the red salmon of the Pacific Coast. Entering a certain inlet on the west coast of Vancouver

Island are two streams both supporting runs of red salmon. One of these streams is short with a gentle fall and it is easy of ascent for the salmon going to the spawning grounds. The other is much longer and is a continuous series of small falls, cascades and rapids. The salmon entering the short stream are comparatively short, heavily bodied and with a weak caudal peduncle. In the other stream, however, the fish are long and racy with a strong tail, their whole structure fitting them for the hard journey to the spawning grounds. Not only this but their very chemical constitution is different. The salmon has, so to speak, an oil burning engine and as if in anticipation of what they have before them, the salmon which enter the long hard stream store up during their life in the ocean a much greater amount of fat. The difference in fat content is so great that the canneries pack the fish separately, putting them in different grades. Now it so happens that the fishery in which the fish are taken is so located that both forms are taken together but the difference in appearance is so great that the ordinary cannery helpers, quite untrained in the intricacies of systematic ichthyology, are able readily to separate the fish as they lay on the cannery floor.

But not all of the differences are as clear cut as this. More often the differences are such that they can only be found by careful statistical studies of such things as proportional measurements, fin ray, branchiostegal and scale counts, etc. In other cases there are differences in growth rates which appear to be inherited even when the fishes are transplanted and reared for several generations in a new environment. And other races have been distinguished by the presence of different age groups. In extreme cases also it has not been possible to show any difference between the fish in two different localities even though there has been every reason to suppose that the two colonies were as

sharply isolated as in other cases where marked differences have been shown. In such cases it seems possible that the isolation has not continued long enough to be effective or it may be that the general conditions in the two localities are so nearly identical that differentiation will be extremely slow.

I wish now to touch on the very great practical importance which this matter of races has for us in the work of conservation. Fundamentally it resolves itself into this: If it is found that a given fishery draws solely or chiefly upon a single race or a small number of races the problems are quite different than when a fishery draws upon a large general stock of fish composed of many races. In the first place an intensive fishery may very readily deplete a single race to the point of absolute extinction but such a possibility is the more remote the greater number of races present on the fishing grounds. It becomes, therefore, of primary importance to those of us who are interested in the conservation of our fishery resources to determine the racial constitutions of the stocks of fish on which we are drawing. These racial studies form no small part of the work of many of the Bureau's investigations and have already proved of great practical importance in the care of the fisheries, but are, as I believe, of fundamental importance to an understanding of species formation.

Present investigations by Rounsfels in Alaska reveal the existence of local races of herring, even in localities only a few miles apart and that the fish are not extensively migratory. This is extremely significant as showing the possibility of individual races being literally wiped out in the absence of proper regulation. Thompson has shown the lack of general intermingling of the Pacific halibut on the Southern grounds and is establishing distinguishing characters by means of which the separate races may be distinguished. For years, the fishermen of the South Atlantic coast have

contended that the Florida mullet stocks migrated up along the coast to North Carolina. Yet the work of Higgins indicates an independent stock in North Carolina waters.

I would therefore like to leave this thought with the fishery members of this society that any knowledge they may contribute toward the establishment of races and the extent of each will be extremely helpful to the fishery administration. The systematist will in time profit by gaining a better understanding of species formation.

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ANOTHER PROWFISH (*ZAPRORA SILENUS*) RECORD

The Prowfish (*Zaprora silenus* Jordan) has been recorded previously from three localities (Jordan 1896, Evermann and Goldsborough 1907, Halkett 1913, Kendall 1914). Evermann and Goldsborough are apparently in error in stating that the first two specimens recorded were "both taken in Nanaimo harbor, B. C." I am indebted to Mr. F. Kermode, Director of the Provincial Museum, Victoria, for the information that "the type was taken from off the mouth of Nanaimo Harbor in November 1895. The second specimen which is in the Provincial Museum is only half the size, and was taken from the Straits of Juan de Fuca near Victoria in 1897." This record has already been published by Halkett. The specimen recorded by Kendall was taken in April, 1914, in 65 fathoms of water in lat. 58°5′N., long. 149°W.

For the specimen now recorded which is in the collection of the Department of Biology, University of Toronto, we are indebted to Mr. D. B. Finn, Director of the Pacific Experimental Station for Fish-

eries, Prince Rupert, B. C., who secured it from a halibut fisherman. It was taken off Anthony Isle in the North Pacific in 40 fathoms of water in the spring of 1926. Two or three other specimens were taken at the same time but only one was brought ashore. Following are a few of the measurements: length 34½ inches (69.5 cm. to end of vertebral column), head 13 cm., eye 2 cm., depth 15 cm., dorsal fin with 58 rays, anal with 27.

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NOTES ON THE FOOD OF SOME ONONDAGA *URODELA*

During the years of 1916 and 1917, James R. Slater made a study of the Onondaga County *Urodela*. The distribution, breeding habits, larval life and food constituted the main outlines of his study. In due time this material was assembled under my direction as a Master's thesis.

Dr. S. C. Bishop of the New York State Museum has read recently Mr. Slater's thesis and writes me that most of the observations on the food are valuable and should be reported.

When I began this study in 1916 I was impressed with the meager information on the food habits of the salamanders. Most of the statements were general and vague and were not associated with a specific number of individuals. When these results were

analyzed, it was found that the only statement on the food of *Urodeles* in the New York State Bulletin on Reptiles and Batrachians was that "Their food consists almost entirely of insects, so they have a distinct economic value."

Amblystoma maculatum studies were mostly taken in early spring. This is during the breeding season while they are migrating to the water and when they remain until nearly May first, during this period they do not eat. All the specimens taken in the water had no food in their stomachs or other parts of their digestive tracts. Sand was the only material found in their alimentary canal. There was food in the form of small animals in the water when the specimens were taken but it appears that this salamander is not in the habit of taking food at this time.

The absence of food in their stomachs was not the only evidence of this fact. Their intestine for some distance from the stomach was a decided green, and the intestine was less coiled than in specimens which have had food for some time. This condition has been shown, in other animals, to be the result of prolonged starvation. I found a similar condition in starvation experiments carried out on the bow-fin, *Amia calva*.

After *Amblystoma maculatum* left the water, food was found in the stomach of each specimen. Whereupon we found their food to consist of beetles, centipedes, earthworms, snails, pill-bugs, spiders and lepidopteran larvae.

In July the favorite food of *Amblystoma* larvae was fish—"sticker-backs". These fish are very abundant in Branchippus Pond in July but as they are exceedingly quick in their movements, it is difficult to see how the larvae manage to capture them. It is also surprising to see how many fish are to be found in a single stomach. In one larvae 1.75 inches in length, we found two fish 12 and 15 mm. in length respectively.

About the only other food was water-boatmen and one giant waterbug was found.

DETAILS OF FOOD OF
Amblystoma maculatum

Specimen No.	*Taken*	*Length*		*Total*	*Sex**	*Food content of stomach*
53	5-20	2.4	1.5	3.9	f	Centipedes 2, earthworm, snails, pill-bug.
54	6-7	2.8	2.0	4.8	f	O
57	7-4	3.3	3.0	6.3	F	Snail, beetle (calosoma), julus (diplopod)
58	7-15	2.6	2.5	5.1	M	Earthworm (piece 3cm.) stone cricket (27mm.)
59	"	2.1	2.0	4.1	M	Long-horned grasshopper (.75 cm.), centipede snail.
50	4-13			6.0		Not preserved.
51	"			6.5		"
52	5-4	3.7	3.7	7.4	F	Centipede.
55	6-19	2.8	2.3	5.1	M	Earthworm, insect larvae.
56	"	2.6	2.0	4.6	M	Centipede, large, pill-bug, stone cricket, small.
61	5-20	3.5	3.2	6.7	F	Dirt, earthworms 3 (7cm. each), beetles 3 (calosoma) plant root 3 cm.
62	"	3.7	2.7	6.4	m	Centipede (3 cm.), julus 3, stone cricket (6 mm.).
63	6-7	3 3	3 0	6.3	F	Centipedes 3 (4 cm.), scavenger beetle.

*Small letter indicates immature specimen, while capital letter indicates maturity.

Plethodon cinereus cinereus

Cochran, '11, reported on the food of the Red-backed salamander and found bugs, cut-worms, fleas, midges, mosquito wigglers, plant-lice and wasp-like insects.

The food of this salamander is varied and the following gives the order of abundance: ants, earthworms, beetles, centipedes, pill-bugs, snails, mites, insect larvae, spiders, julus, spring-tails, roundworms, flies and grasshoppers. Practically every specimen

taken had some recognizable food in its stomach although they do not appear to eat during the breeding season, which lasts about five weeks. No mature females were found near the surface during the breeding season and when they did return to the surface, soon gorged themselves with food. The males taken during the five week period had very little food in their stomachs.

DETAILS OF FOOD OF
Plethodon cinereus cinereus

Specimen No.	*Taken*	*Length*		*Total*	*Sex*	*Food content of stomach*
251	5-17	1.3	1.2	2.5	M	Slug (snail), ants, 3, small brown.
252	"	1.6	1.5	3.1	F	Earthworm (trace), ants, 4 ant larvae.
253	"	1.5	1.3	2.8	M	Small brown beetle, ants, 3, ant larvae.
254	"	1.3	out		m	Centipede, beetle (leaf-eater) beetle larva, spring-tail, ants 2, large, ant larvae.
255	"	1.0	0.8	1.8	m	Centipede, ants 2 large.
256	6-19	1.7	1.7	3.4	M	Beetles land, snail.
257	7-4	1.7	1.2	2.9	M	
257.5	7-19	1.6	1.5	3.1	M	O recognizable.
258	4-36	1.3	out		M	Earthworm 2 cm.
259	"	1.1	out		m	Beetle larvae, insect larvae.
260	"	1.3	1.1	2.4	M	Julus, mites 10 (arachnids) centipede (trace).
261	"	1.3	0.5	1.8	m	Ants 4.
262	5-4	1.5	1.3	2.8	M	Ants 3, rove beetles 2.
263	"	1.5	1.3	2.8	F	Pill-bug (small), mites 7.
264	"	1.4	1.2	2.6	M	Ants 3.
265	"	1.3	1.2	2.5	M	Spider (small), beetle (ground) beetle larvae, round worm, ants 4.
266	"	1.5	out		M	Ants 6 or 7.
267	5-4	1.6	out		M	Pill-bugs 3, earthworms 3.
268	"	1.3	out		M	Lepidopteran larvae.
269	"	1.4	out		?	Earthworm 2 cm. ants 3.
270	"	1.2	out		m	Lepidopteran larvae, ant, large earthworm, snail (small).

271	1-10	1.0	0.8	1.8	m	Mite, beetle larvae 2, earthworm (trace).
272	5-20	1.6	1.5	3.1	M	Pill-bug, ants 2 black, ants 1 brown, mites 2, ants 3, centipede.
273	"	1.3	1.0	2.3	m	Long-horned beetles 3, ants brown.
274	"	1.3	1.2	2.6	?	Beetles 2 (chrysomelid), dipteran (small), spider.
275	"	1.0	0.5	1.5	m	Centipede, mite.
276	"	1.0	0.3	1.3	f	" "
201	5-4	3.3	3.5	6.8	M	Pill-bug small, centipede 3, small, ants 6, small.
202	"	3.0	3.2	6.2	F23	Julus, snail, ant small, dirt.
203	5-17	3.2	3.2	6.5	M	Ant, rove beetle, insect trace.
204	4-21	2.8	out		f	O
205	6-5	3.3	2.7—		M	Insect trace.
206	"	2.2	2.2	4.4	M	Click beetle, small snout beetle 2 (?).
207	"	2.0	1.8—		f	Beetle larva, daddy longlegs spider 2 large, ants 4, beetles 5 small.
208	6-19	3.4	3.6	7.0	F	Julus, 2 (25 mm.), ant large, earthworm 1 (7 cm.), lepidopteran larva (4 cm.), ground beetle (calosoma), click beetle, coleopteran larva (1 cm.).
209	"	3.3	3.6	6.9	F	Julus 3, beetles 2, ants 5 small black, coleopteran larva, ground beetle, round worm (small nematode var.) dirt much.
210	"	3.5	3.0	6.5	M	Beetles land 6, ground beetles 3.
211	"	3.2	3.0	6.2	M	Julus 2, pill-bug, small black ant, beetle trace.
212	"	2.3	2.3	4.6	?	O recognizable.
213	2-19	1.8	1.6	3.4	?	Ants 5, brown beetle, mite small.
214	"	1.3	1.1	2.4	?	Insect larvae small, ants 4 black, coeloptera larva, beetle small.
215	7-4	2.4	3.0	5.4	M	Long-horned grasshopper (15 mm.), centipede small, julus (diplopod).

216	7-15	2.6	2.6	6.2	M	Julus (25 mm.), small spider (mite), beetle small, small fly wing.
217	7-15	1.6	1.2	2.8	m	Ants 7 or 8 small.
218	"	1.1	1.0	2.1	?	Beetles small, mites 2.
218	"	0.7	0.5	1.2	?	"
220	"	0.8	0.6	1.4	?	"

Gyrinophilus porphyriticus studies were limited to four specimens in which the food was mostly digested. There was a trace of insects and grass.

Eurycea bislineata eat insect larvae, earthworms and adult insects; while the young larvae eat caddis-fly larvae and beetle larvae.

DETAILS OF FOOD OF
Eurycea bislineata

Specimen No.	*Taken*	*Length*		*Total*	*Sex*	*Stomach contents*
376	7-12	1.6	2.1	3.7	M	Wings of insects (traces).
377*	7-22	1.2	1.1	2.3	?	Earthworm, beetle larva.
378	"	1.2	1.1	2.3	?	O recognizable.
379	"	1.1	1.0	2.1	?	Lepidoptera larva, diptera larva.
380	"	1.1	1.0	2.1	?	Beetle larva.

LARVAL S. bislineatus food, specimens taken
7-22 insect larvae, probably cadis-fly.
7-19 beetle larva (?).
7-17 O recognizable.
*Specimens No. 377–380 still have external gills.

Our records of the newt, *Triturus viridescens viridescens* are more complete. From the appearance of the material found in the stomachs of the specimens of this species which were taken in early spring, one would judge that it had been there a number of months. It had an old appearance the snail shells had dissolved out of them; the tougher membranes of the snail's body remained in the opening of the shell. The bettles had heavy coverings and only the hard parts remained; and the lepidoptera larvae were certainly

not eaten this spring, for there were no lepidopteran larvae around that early. Thus we are led to suggest that *Triturus* may eat food in the fall, parts of which remain in the stomach through to early spring. This food is in the form of animals with hard coverings.

A possible reason for this habit may be more readily found in the life activities of *Triturus* than in any of the other *Urodeles*, for this species is more or less active all winter. It is often seen swimming around in ponds in under the ice, whenever the temperature begins to rise during the winter.

When *Triturus* is breeding—the last week in April and most of May—it eats but little; while in June and July it eats heavily.

The five kinds of animals used mostly as food are: snails, water-boatmen, fish, earthworms, and beetle larvae. Other kinds of food are: clams, daphnia, lepidoptran larvae, amphibian eggs, including its own eggs, and probably *Amblystoma* and *Rana* eggs, giant water-bugs, insect larvae, mosquito larvae, and pupa, annelid, beetles, slugs, rat-tail larvae, fly, May fly, and water-plants.

The food of *Triturus* when it is on the land, ie.., during its land stage of development, appears to be snails, spiders and mites, beetles, spring-tails, insect larvae, and leeches.

The larval food of *Triturus* before it leaves the water, was largely daphnia, a few insect larvae, earthworms and other microscopic animals.

From the above, it appears that the *Urodeles* use insects as food more than the animals of any other class, but it is probable that not half of their food is insects. To a considerable extent, they use earthworms, snails, centipedes, fish, and spiders. Many other kinds of animals are also used, such as: daphnia, pill-bugs, julus. clams, slugs, amphibian eggs, mites, roundworms, leeches, and some vegetable matter.

Details of the Food of *Triturus viridescens viridescens*

Specimen No.	*Taken*	*Length*		*Total*	*Sex*	*Food as found in stomach*
105	4-16	1.7	1.5	3.2	M*	Lepidopteran larva.
106	"	1.8	1.7	3.5	M	Lepidopteran larva.
107	4-18	1.8	1.7	3.5	M	Beetle larvae, 2, daphnia, snail small, insect larva.
108	4-20	1.8	2.0	3.8	M	Beetle (trace).
109	"	1.6	1.8	3.4	M	Slug.
110	4-21	1.7	1.8	3.5	M	Earthworm.
111	4-25	1.8	1.7	3.5	M	Rat-tail larvae 2.
112	"	1.8	2.1	3.9	M	Snails 5, (2 kinds).
113	"	1.6	1.8	3.4	M	Snails (2 kinds), beetle larva, daphnia many, amphibian egg
114	"	1.7	2.2	3.9	M	Snail, water plant, amphibian egg.
115	4-26	1.5	out		F	O
116	4-29	1.8	2.0	3.8	F	O recognizable.
117	5-1	1.7	1.6	3.1	F	O
118	5-2	1.9	1.7	3.6	M	Earthworm.
119	5-4	1.8	1.9	3.7	M	Beetle larvae 2 kinds.
120	"	1.7	1.7	3.4	M	Snail.
121	"	1.8	1.8	3.6	M	Egg, snail.
122	5-4	1.9	1.9	3.8	F	Snail.
123	"	2.1	2.3	4.4	F	Mosquito pupa.
124	"	1.8	1.7	3.4	F	Egg (*amblystoma* ?) and jelly capsule.
125	"	1.8	1.8	3.6	F	Earthworm large.
125	"	1.8	1.8	3.6	F	O recognizable.
	5-11					Rat-tail larva large, lepidopteran larva large, snails 5 shells look old.
127	5-12	1.5	1.4	2.9	M	Earthworm (4 cm.).
128	"	1.7	1.8	3.5	M	O recognizable.
129	"	2.0	1.7	3.7	M	Beetle larvae about 20 small.
130	"	1.8	2.0	3.8	M	O
131	"	2.0	2.3	4.3	M	O recognizable.
132	"	2.0	1.8	3.8	M	Annelid small.
133	"	1.6	1.5	3.1	M	O
134	"	2.0	1.7	3.7	M	Beetle larvae several small.
135	"	1.9	1.9	3.8	M	O
136	"	1.9	1.8	3.7	M	O
137	"	1.7	1.8	3.5	M	O recognizable.
138	"	1.7	1.6	3.2	M	O "

139	5-12	1.7	1.4	3.1	M	O recognizable.
140	"	2.5	1.9	4.4	F	O
141	"	1.9	1.8	3.7	F	Earthworm (?) small.
142	"	1.7	1.7	3.4	F	O recognizable.
143	"	1.6	1.4	3.0	F	O "
144	"	1.6	1.5	3.1	F	O "
145	5-25	1.7	1.8	3.5	M	O "
146	6-5	1.7	1.5	3.2	M	Fish "stickle-back"
147	"	1.7	1.5	3.2	F	O recognizable.
148	"	1.8	1.9	3.7	F	Fish 3, water-boatmen 2, mosquito pupa.
149	6-19	1.8	1.8	3.6	F	Snails 2, fish 3 (14 mm.), water-boatmen 1.
150	"	1.9	2.2	4.1	F	Clams 5 (1-6 mm.), snail, *diemyctylus viridescens* eggs 2, water beetle small.
154	7-15	1.9	1.8	3.7	F	Snails 19, fish, May fly larva (?).
155	"	1.8	1.9	3.7	F	Daphnia 24, snail, insect larva unidentified.
156	7-22	1.9	2.1	4.0	F	Water-boatmen 15, giant water-bug.
157	"	1.9	2.0	3.9	M	Giant water-bug parts of 2, insect larva, snail.
158	"	1.9	2.0	3.9	F	Water-boatmen 9, fish "sticker-back" 2 (15 mm.).
159	"	1.8	1.9	3.7	M	Water-boatmen 9.
160	"	1.9	2.1	4.0	M	Water-boatmen 1 adult, 4 nymphs.
161	"	2.0	2.1	4.1	F	O recognizable.
162	"	1.8	2.0	3.8	F	Fish sticker-back 25 mm. water-boatmen 8.
163	7-22	1.9	2.0	3.9	M	Water-boatmen 10.
164	"	1.8	1.7	3.5	F	O
165	"	1.7	1.6	3.3	F	Snails, water-boatmen 3, fly wing.
166	"	1.6	1.5	3.1	M	O
167	5-18	1.7	2.0	3.7	F	Earthworms 2 (45 mm.).

Red Land-Form—Red Eft

151	6-19	1.6	1.4	3.0	m	Snails 6, beetle (*chrysomelida*), leech, spiders 6, spring tail 6 (*podura*).
152	"	1.6	1.4	3.0	M	Spring-tail 15, snails 2, insect larva.

153	7-15	1.7	1.6	3.3	?	Snails, 3, beetle (*chrysomelida*).
168	5-20	1.0	0.9	1.9	?	Mites 2 red, snail.

*The females caught during the first part of the season were kept to observe their breeding habits.

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BANANA STOWAWAYS

Recently there has been a renewal of interest in banana stowaways. L. A. Adams, *Science*, February 24, 1928, and George Wagner, also Edward R. Warren, *Science*, April 20, 1928, all record the finding of species of the Marsupial genus *Marmosa* in bunches of bananas. Wagner also records two small boas.

Through local sources three such records have been made available during the past winter, as follows:

A *Boa imperator* 30 inches in length was collected by employes of the Butner Produce Company. The snake was so badly injured by blows, by burning paper thrown into its temporary quarters, a barrel, to illuminate it, and by the first aid given it in the Zoology laboratory, that, unlike a snake, it did not survive to nightfall.

A geckonid lizard, *Sphaerodactylus glaucus*, adult, little more than an inch in length, lived in the laboratory for ten days or more, in spite of nightly exposure to low temperatures.

The grocer, Leslie W. Rue, collected another specimen with adhesive pads, an adult male tree-frog, *Hyla venulosa*. During transportation to the laboratory it apparently succumbed to the low temperature, but recovered in a moment in warm tap water, and lived for many days. Excellent photographs of its milky defensive cutaneous exudation were obtained. This

specimen is much larger than native *Hylas*, about $3\frac{1}{2}$ inches in body length. The last two were identified by Dr. G. K. Noble, who ascribes to them a probable source from Honduras or southern Mexico.

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THE LONGEVITY OF *AMBYSTOMA MACULATUM* IN CAPTIVITY

The length of life of some specimens of *Hyla versicolor* was the subject of a brief note in Copeia, No. 72, Aug. 15, 1919.

I also mentioned in this paper a specimen of *Ambystoma maculatum* captured as an adult in April 1912 and living in the same vivarium with the *Hylas*. It may interest Copeia readers to know that this same salamander is still living in the care of Dr. Alfred O. Gross of Bowdoin College together with another that I captured as a larva in the summer of 1915 or 1916 (unfortunately no exact record was kept). These salamanders were fed on earthworms at first but of late years seem to be thriving fully as well on Hamburg steak.

As *A. maculatum* requires at least two and probably three years to reach maturity the older one must be at least 18 years old and the younger 12 or 13 years with prospects of both living for several years longer.

I have tried several times keeping the smaller salamanders; *Plethodon erythronotus*, *Desmognathus fusca* and *Eurycea bislineata* in the same vivarium but without success. They ate well and seemed to thrive for a time but always disappeared within a few months at most. I have no proof but think the *Ambystomas* were responsible, as they would eat almost anything alive

that was not too big, and I also believe that if unmolested some of these salamanders might live as long as *Ambystoma*.

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AN ANNOTATED LIST OF THE LIZARDS OF LEE'S FERRY, ARIZONA

The Lee's Ferry region as defined here includes Coconino county north of the Little Colorado River and the north end of Navajo county Arizona. The country is semi-arid except for the Kaibab plateau which is covered with a forest made up largely of Yellow Pine and Black Spruce. Reptiles are abundant on the Kaibab plateau only at the rim of the Grand Canyon but they swarm in exceptionally large numbers in the desert region of the entire district. The desert country includes the Painted Desert south of the Colorado River, House Rock Valley north of the Colorado River and the banks of the Colorado in Marble Canyon.

This report is based on a collection of one hundred thirty-six specimens taken in 1926 and four hundred twenty three specimens taken in 1927 in the region. The following is a list of the species found.

1. *Sauromalus obesus* (Baird)
2. *Crotaphytus collaris baileyi* (Stejneger)
3. *Crotaphytus wislizenii* Baird and Girard
4. *Holbrookia maculata approximans* (Baird)
5. *Uta levis* Stejneger
6. *Uta stansburiana stansburiana* (Baird and Girard)
7. *Uta stansburiana elegans* (Yarrow)
8. *Sceloporus graciosus graciosus* (Baird and Girard)
9. *Sceloporus consobrinus* Baird and Girard
10. *Sceloporus elongatus* Stenjeger
11. *Sceloporus magister* Hallowell

12. *Phrynosoma douglassii ornatissimum* (Girard)
13. *Phrynosoma platyrhinos* Girard
14. *Cnemidophorus gularis velox* new subspecies
15. *Cnemidophorus tessellatus tessellatus* (Say)

The above list includes all of the lizards which have been described from the region except *Uta ornata symmetrica* (Baird) and *Cnemidophorus gularis* Baird and Girard. The specimens of *Uta levis* taken here were intermediate between the type of *Uta levis* and *Uta ornata symmetrica* but have been referred to *Uta levis*. The reasons for the creation of a new subspecies will be apparent from the description.

SAUROMALUS. *Sauromalus obesus* was found to be abundant along the Colorado where there were large rocks. They are apparently only locally common and in this region seem to be restricted to the sand filled talus at the foot of the cliff along the river.

CROTAPHYTUS. *Crotaphytus collaris baileyi* and *C. wislizenii* do not seem to compete here for either food or hiding places. All of the specimens of *Crotaphytus collaris baileyi* were found in rocky places while *C. wislizenii* was found only on sandy flats where it was hiding in the loose sand or in the burrows of rodents. Stomachs of *Crotaphytus collaris* usually contained grasshoppers but occasionally small rock inhabiting lizards were found in the stomachs. The only species of lizard found in the stomachs of *Crotaphytus wislizenii* was *Holbrookia maculata approximans*. The species of *Holbrookia* live exclusively on the sandy flats.

HOLBROOKIA. *Holbrookia maculata approximans* appeared to be the most abundant of the lizards. They are very inconspicuous and show considerable variation in color.

UTA. Three species of Uta were present in the region; *Uta levis*, *Uta stansburiana stansburiana*, and *Uta stansburiana elegans*. *Uta levis* was restricted to

the edge of the Kiabab plateau while the others were found in the desert region. *Uta stansburiana stansburiana* was not found south of the Utah state line except as a transition form.

SCELOPORUS. Of this genus four species have been described from the locality. One species, *Sceloporus magister*, has no close affinity to the other species of *Sceloporus* occurring here but these three other species intergrade almost completely north of the Colorado. These three were all taken together at the north rim of the Grand Canyon at Bright Angel Point where they seem to be competing directly for food and hiding places. The only other lizards found on the north rim were *Uta levis* and *Phrynosoma douglassii ornatissimum* and these were not common.

COMPARISON OF SPECIES OF SCELOPORUS

Species	*Scales on back*	*Dorsal Scales*	*Femoral Pores*
Sceloporus graciosus	42–53 (47.8)	9–13	9–16 (13)
S. elongatus	40–53 (47.3)	8–13	15–22 (18.7)
S. consobrinus	36–47 (39.0)	8–11	12–19 (15.3)

From "Reptiles of Western North America" Van Denburgh, Cal. Acad. Sci., Vol. 1, p. 262.

PHRYNOSOMA. Two species only were collected here and one, *Phrynosoma platyrhinos*, only at the state line near Fredonia, Arizona. The other, *Phrynosoma douglassii ornatissimum* was found common everywhere except on the plateau.

CNEMIDOPHORUS. *Cnemidophorus tessellatus tessellatus* was found to be rather common all over the desert except around Oraibi where it was replaced by *Cnemidophorus gularis velox*. Both species seem to be independent of the presence of rocks for hiding.

CNEMIDOPHORUS GULARIS VELOX, NEW SUBSPECIES.

Description. Snout long and with sides not quite vertical. Nostrils opening in anterior nasal plates which are in contact on top of snout. Parietals longer than frontoparietals. Anterior gulars of nearly uniform size but becoming abruptly smaller posteriorly. About four rows of scales on collar of nearly uniform

size. Eight rows of ventral plates. Back covered with small smooth convex granules. Posterior surface of the forearm with enlarged plates but not so large as in *gularis gularis*. Tail very long, more than twice the length of the body. Femoral pores 15. Color on back blackish, becoming lighter toward the sides. Three yellow stripes on each side, the two lower ones extending forward to the eye and the upper one to the third supraocular. A central stripe, yellow but fainter than the stripes on the sides forking just posterior to the central parietal plates. No light spots present between the stripes even on full grown specimens. Color of the head varies from black to bright green. Upper surfaces of the legs same as sides. A light stripe on back of things. Underparts uniform bluish white. Young similarly colored but usually darker.

Rremarks. The specimens defined above differ from *gularis gularis* slightly but the variations were constant in the specimens observed. The enlarged scales on the back of the forearm are about half the size of the scales on the forearm of *gularis gularis*. The enlarged scales on the collar are in four rows and of nearly uniform size while in the typical form they are usually in two rows and become larger toward the sides. In the specimens examined the granules of the back were slightly larger than in the typical form. Unfortunately the writer has been unable to examine a large series of specimens because although they were not uncommon they were the only ones swift enough to elude the party consistently. Three were taken at Oraibi, Arizona, and one at Pueblo Bonito, New Mexico. From fifty to one hundred were seen at close range and the color was remarkably constant. In all the specimens there were no light spots between the stripes and the very slender body and bright green head made them resemble *Cnemidophorus sexlineatus*.

Distribution. They seem to be restricted in distribution to the sandy deserts south of the Colorado River

from Lee's Ferry, Arizona, to Peublo Bonito, New Mexico. They are replaced to the south at Winslow, Arizona, and at Flagstaff by *Cnemidophorus gularis gularis* while to the north of the district *Cnemidophorus tessellatus tessellatus* is found.

Conclusions. In the accompanying table it will be observed that only one species is restricted to the region, two are considered intrusions from the west, four from the north, three from the south, and five are of general distribution but of these *Crotaphytus collaris baileyi* and *Phrynosoma douglassii ornatissimum* are not abundant north of Rockville, Utah. In a general way they may be considered intrusions from the south.

DISTRIBUTION OF LIZARDS IN LEE'S FERRY REGION

(X indicates presence — indicates absence)

Species	*Utah*	*Arizona north of Colorado River*	*Arizona south of Little Colorado River*
Sauromalus obesus*	—	X	—
Crotaphytus wislizenii	X	X	X
C. collaris baileyi	X	X	X
Holbrookia maculata	—	X	X
Uta levis	X	—	—
U. stansburiana stans.	X	X	—
U. stansburiana elegans	—	X	X
Sceloporus consobrinus	X	X	X
S. graciosus graciosus	X	X	—
S. elongatus	X	X	—
S. magister	—	X	X
Phrynosoma platyrhinos*	—	X	—
P. doulglassii ornatiss.	X	X	X
Cnemidophorus gularis velox	—	X	—
C. tessellatus tessellatus	X	X	X

*Instrusions from the west.

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EXTIRPATION OF CERTAIN NECK GROWTHS IN POND TURTLES

It is not uncommon to observe tumor like neck growths in small or baby turtles that one frequently

sees in nature rooms and places of sale and exhibition. Local dealers have informed the writer that this pathological condition will frequently result in loss of stock due to general unfitness for sale or premature death.

The immediate physiological cause for their death is apparent when one observes the close proximity of these growths to the trachea. Slow choking during periods of three weeks to two months on this respiratory organ causes turgidity, exopthalmia, an abnormally small amount of red cells in the blood (two million to the cubic millimeter vs. six million in normal specimens of same species) indicating an anaemic condition, and finally resulting in the death of the turtle.

As the growths are near the thyroid gland, which is found running longitudinally along the neck muscles, it may be suspected that they bear some relation to hyperthyroidism (Basedow's disease) as is evidenced in higher forms.

As a means of effectively removing the pressure caused by these growths which press on the trachea; I have through experiment arrived at the following technique for successful extirpation:

1. Bathe and scrub the specimen with warm water and a mild soap to remove all foreign matter.
2. With cotton applicator wash affected parts of neck and skin in throat region with normal saline solution.
3. With sterile razor blade or sharp scalpel slit the skin covering the growth and excise same.
4. Cleanse wound with saline solution and apply a sufficient amount of collodion to fill the orifice.

Care in placing the operated specimens in separate pans of clean water for a few days, will aid in their quick recovery and in a week or less the skin will be entirely whole. Due to friction of the neck between the carapace and plastron it may be necessary to apply a second application of collodion.

The following pond turtles were successfully subjected to the above technique and are still living. (February 22, 1928.)

Chrysemys picta (Schneider), Eastern Painted Turtle.
Carapace $2\frac{1}{2}''$ x $2\frac{1}{4}''$ Plastron $2\frac{1}{4}''$ x $2''$
Growth removed from ventral side of neck, June 11, 1927.

Clemmys guttata (Schneider), Spotted Pond Turtle.
Carapace $3\frac{1}{2}''$ x $2\frac{1}{4}''$ Plastron $2\frac{3}{4}''$ x $1\frac{3}{4}''$
Growths removed from right lateral and ventral sides of neck, July 7, 1927.

Graptemys geographica (Le Sueur), Geographical Terrapin.
Carapace $2\frac{1}{2}''$ x $2''$ Plastron $2''$ x $1\frac{3}{4}''$
Growths removed from left lateral side of neck, May 5, 1927.

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HERPETOLOGICAL OBSERVATIONS IN THE ADIRONDACK MOUNTAINS, NEW YORK

The region covered by this annotated list, lies entirely within the Adirondack Forest Park in Essex County. The area may be roughly circumscribed by drawing a line through Lake Placid, Keene and Elizabethtown on the north, Paradox Lake and Mt. Pharaoh on the east, Schroon Lake and Riverside on the south and Tahawus on the west. The observations were made at altitudes ranging between 800 and 3800 feet. The season spent in the locality extended from the 19th of June to the 6th of September, 1926.

Ambystoma maculatum (Shaw). Spotted Salamander. Although only two adults were found, the larvae inhabited many of the suitable pools. On June 21st seven clusters of eggs were discovered, from which most of the larvae had hatched. By August 15th the pools where larvae had previously been found were

dried up, most of the larvae probably had metamorphosed by that time. Larvae collected from these pools and reared in a shaded aquarium, metamorphosed between August 25th and September 2nd.

Ambystoma jeffersonianum (Green). Jefferson's Salamander. Among the Spotted Salamander larvae which were reared in an aquarium there were some pale colored individuals. Upon metamorphosis these pale colored specimens proved to be Jefferson's Salamander. The date of metamorphosis, however, was later, and took place between the 7th and 14th of September.

Triturus viridescens viridescens Raf. Newt. This species is common in most of the lakes of the region. Between the 20th and 30th of June breeding males were abundant but only two mated pairs were found. Larvae 29 mm. in length were collected on August 11th. The red terrestrial form was common everywhere in the forests especially in the vicinity of ponds and lakes.

Desmognathus fuscus fuscus (Raf.). The Dusky Salamander is common but very local in its distribution. Most of the brooks are too cold and swift for it, but the smaller slowly trickling brooks in the valleys were favored. Two clusters of eggs were discovered, one on August the 13th and the other on August 15th, containing 21 and 22 eggs each, respectively. Both clusters of eggs contained well-developed embryos, which hatched from August 31st to September 4th.

Desmognathus fuscus ochrophaeus Cope. The Mountain Salamander is more plentiful than the Dusky Salamander, and is common on the higher slopes where some small muddy debris-filled brooklet finds its source. In such places *ochrophaeus* is to be found under stones, bark, logs and any other cover where there is a sufficient amount of moisture. Most of the

specimens were found at altitudes between 1000 and 2000 feet.

Plethodon cinereus (Green). The Red-backed Salamander is plentiful in the lowlands as well as on the mountain slopes, and reaches its greatest abundance in mixed forests of hemlock and arbor vitae. No grey-backed specimens were found in the region, whereas in the pine barrens of Long Island I have found only the grey-backed form, elsewhere I have found both color phases side by side.

Eurcea bislineata bislineata (Green). Two-lined Salamander. Few adults of this species were found; but the larvae were fairly common in some of the slower and shallower brooks. Perhaps the abundance of their enemies the fishes in the brooks of the region and the long larval period of this species accounts for the scarcity of the adults. On August 10th a cluster of 225 eggs was found attached to the under side of a stone, evidently the laying of a number of females. The stone measured 6 x $8\frac{1}{2}$ inches and 4 inches thick. The eggs were closely clustered together yet each egg was firmly attached to the stone, and was constantly bathed by the flowing water.

Gyrinophilus porphyriticus (Green). The Purple Salamander finds an ideal habitat in the cold mountain brooks of the region, and is common. Larvae of three distinct sizes were found, indicating a three year larval period. Both adults and larvae were always found under stones in brooks, and when they were disturbed they immediately darted under another stone. This habit evidently protects the species from the trout and other fishes which inhabit the same streams.

Bufo americanus (Holbrook). The American Toad is common and is found not only in the valleys but also on the high mountain slopes up to an altitude of 3000 feet. On June 23rd the first chorus was heard and the first eggs were found on June 25th; the cold late spring weather may account for the extreme lateness of the

egg-laying season. In this region the toads laid their eggs in the slower moving waters at the edges of mountain brooks, where the larvae were in constant danger of being washed downstream after a heavy rain. Metamorphosing larvae were found from the 20th to the 31st of August.

Hyla versicolor Le Conte. The common Tree Toad is locally abundant. The chorus was in full force on the 23rd of June and continued for another two weeks thereafter. Most of the breeding colonies were located in grassy pools formed by the backwaters of streams. Tadpoles examined August 20th showed no limb buds, indicating a late date for metamorphosis.

Hyla crucifer Wied. Spring Peepers were found to be less plentiful than in other parts of New York state. The chorus was still in force on the date of my arrival on the 19th of June, and continued to the end of the month. The Peeper selected the same breeding places as the Tree Toad, but was very much less plentiful than the latter.

Rana pipiens Schreber. Leopard Frogs are plentiful everywhere in the wet valleys. The breeding season had passed before my arrival.

Rana palustris Le Conte. Pickerel Frogs are abundant throughout the region both on the mountain slopes and in the valleys. Newly metamorphosed young were found throughout the month of August.

Rana clamitans Latrielle. Green Frogs are abundant everywhere, on Boreas Mountain a number of individuals of different ages were found at an altitude of 3000 feet. Newly laid egg masses were found on June 29th and by the 10th of July the mating chorus ceased. Metamorphosing tadpoles were found during the entire month of August. Much variation in color and size of the Green Frogs in this region was noted; these variations are not entirely accounted for by age. For instance, around Paradox Lake and Wilcox Pond many of the Green Frogs were yellow-bellied, in some

individuals the entire ventral surface was yellow, in others the yellow area was blotched with white; and in all of the adult males, the yellow extended at least beyond the throat. At Gull Pond only white bellied specimens with uniformly dark green backs were found. The third type, found along cold mountain streams, averaged smaller in size with the ventral surface white vermiculated with dusky.

Rana catesbeiana Shaw. Bullfrogs are still plentiful around the lakes and larger streams in spite of the great demand for their hind legs by the natives. Newly laid egg masses were found on July 3rd, and metamorphosing tadpoles during the entire month of August.

Rana sylvatica Le Conte. Wood Frogs are common in the forests, but no specimens were found on the high mountain tops. Tadpoles were plentiful during the months of June, July and August.

Rana septentrionalis Biard. Mink Frogs were found only at Clear Lake near Boreas Mountain. At this lake on July 25th, many individuals were observed ranging in size from newly metamorphosed young to adults. Metamorphosing tadpoles were found on August 14th. In the "Frog Brook" Miss Dickerson describes the mink frog as decidedly a river frog, never captured in lakes and ponds; as solitary in habit and thoroughly aquatic. At Clear Lake I found thirty individuals sunning themselves on the shore in the manner of the Green Frog and within a space not more than twenty yards in length. On leaping from the shore most of them soon reappeared at the surface of the water and rested there. The adults on being handled emitted an odor similar to that of decaying onions. The only vocal expression heard consisted of four quickly repeated notes, cluck, cluck, cluck, cluck, similar to the protesting notes of the male American Toad when handled during the breeding season.

Storeria dekayi (Holbrook). DeKay's Snake appears to be rare in this region. The only specimen seen was found dead at a roadside and had been killed by an automobile.

Natrix sipedon (Linné). Water snakes were found at Paradox Lake and at some of the smaller lakes, but not many individuals were seen.

Storeria occipito-maculata (Storer). The Red-bellied Snake is common locally. Five specimens were found under two boards near a deserted barn, and three under a fallen fence post at an altitude of 2000 feet. One captive female gave birth to 14 living young on August 29th, 1926.

Liopeltis vernalis (Harlan). The Green Snake was found to be common in large grass covered fields. On August 2nd, 1926, a captive female laid five eggs.

Thamnophis sirtalis (Linné). The Garter Snake was common not only in the fields but in the forests as well. The American Toad appears to be a favorite food, for several specimens were seen in the act of swallowing toads and the stomachs of a number of specimens which were examined contained toads; but two of the Garter Snakes taken from a stone pile, at the edge of a lake, had eaten small perch and minnows.

Thamnophis sauritus (Linné). The Ribbon Snake appears to be rare in the region. Only one specimen was found (near Wilcox Pond).

Lampropeltis triangulum triangulum Lacepede. The Milk Snake is unfortunately known as an "Adder" by the mountain folks and is feared by them as poisonous. Only six specimens were found.

Chelydra serpentina (Linne). Snapping Turtles are common in ponds with muddy or muck bottoms and in slow moving swampy streams. A female with a carapace measuring 285 mm. was captured; she laid 36 eggs on September 1st. A next containing 24 fresh eggs was found at the edge of a road on July 2nd, 1926.

Chrysemys picta (Schneider). The Painted Turtle is common throughout the region. Every lake and pond with some soft bottom is the favorite home of this turtle.

Clemmys insculpta (LeConte). The Wood Tortoise is fairly common. This species appears to average larger in size than specimens from further south; the carapace of one large male measured 203 mm.

JAY A. WEBER

Leonia, N. J.

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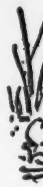

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